Record Center
158398

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF: (SR-6J)

February 20, 2002

Mr. Steven D. Smith
Solutia, Inc.
P.O. Box 66760
St. Louis, Missouri 63166-6760

RE: Draft Groundwater Focused Feasibility Study
Sauget Area 2 Site - St. Clair County, Illinois

Dear Mr. Smith:

Pursuant to the November 24, 2000, Administrative Order on Consent for the Sauget Area 2 Site, the United States Environmental Protection Agency (U.S. EPA) requested a focused feasibility study (FFS) be sumitted to address the known groundwater contamination problem in the vicinity of Site R. Solutia submitted a draft groundwater FFS on December 21, 2001.

The U.S. EPA and the Illinois Environmental Protection Agency (Illinois EPA) have completed their reviews of the Area 2 draft groundwater FFS. Comments on the Area 2 FFS are provided in the following enclosures: Enclosure 1 contains U.S. EPA's general comments on the FFS; Enclosure 2 contains comments on the FFS from U.S. EPA's Technical Assistance and Technology Transfer Branch; Enclosures 3 and 4 are U.S. EPA's comments on the Preliminary Discharge Control Study for Site R and have previously been transmitted to Solutia; and Enclosure 5 contains Illinois EPA's comments on the FFS.

Within 30 calendar days from the date of this letter, please address the comments in the enclosures, and resubmit the revised groundwater FFS for approval. If you have any questions regarding this letter or the enclosures, please feel free to call me at (312) 886-4592.

Sincerely,

Mike Ribordy

Mike Ribordy
Remedial Project Manager
Superfund Division

cc: Thomas Martin, USEPA, w/enclosures
Ken Bardo, USEPA, w/enclosures
Sandra Bron, IEPA, w/enclosures
Peter Barrett, CH2M HILL, w/enclosures
Kevin de la Bruere, USFWS, w/enclosures
Michael Henry, IDNR, w/enclosures

bcc: Record Center, w/enclosures

ENCLOSURE 1

Comments on the Sauget Area 2
Groundwater Focused Feasibility Study

General Comments

A) Data Quality and Usability - Most of the data used in the FFS was not collected under U.S. EPA Superfund oversight. Additional discussion should be included in the FFS to address the issue of data quality and usability for selecting an interim remedial action.

B) Data Inconsistencies -

- Chemical mass discharges - p.1-1 states 680,000 Kg/yr; p.1-9 states 426,000 Kg/yr.
- Hydraulic conductivity ranges: p. 2-9 states a range of (4.7 x 10-2) to (1.4 x 10 -1) and p. 2-11 has a table showing a range of (4 x 10-4) to (1.2 x 10-1).

It would be helpful to know what the correct values are.

C) Remedial Action Objectives

These are stated in Section 3.0. Section 4.1.2.2 says that,"Sediment toxicity is considered the primary measure of effectiveness of the any [sic] remedial action". However, the method for determining sediment toxicity is not clearly explained. It is assumed that the tests used in the 2001 Menzie-cura study will also be used to ascertain that RAOs are being met, although an Apparent Effects Threshold should also be considered. The use of sediment toxicity values needs to be more clearly defined.

D) Detailed Analysis of Alternatives

U.S. EPA generally does not consider an alternative that includes long-term monitoring and institutional controls a No Action alternative. Therefore, the "no action" designation on Groundwater Alternative A should be removed and a no action alternative included as one of the alternatives.

E) Ecological Risk Assessment, Section 2.6.2.3 (Menzie-Cura, 2001)

This study was an ecological risk assessment of the plume discharge area of Site R. This study appropriately included upstream reference areas that were matched to the particle size distribution of the site study area. The background reference area was used to establish the conditions of acceptable exposure, toxicity and risk. Sediment and water column toxicity were evaluated using toxicity tests in which fish and aquatic invertebrate organisms were exposed to sediment. The specific tests used are not identified in the text. Normally, sediment toxicity tests are performed using standardized methods and organisms such as the fathead minnow, Hyallela (a scud) and Chironomus (an insect). Hyallela and Chironomus are typical organisms in a benthic invertebrate community that lives in the sediment. The fathead minnow feeds on sediment-dwelling as well as other aquatic invertebrates like Ceriodaphnia that live in the water column above the sediment.

In Summary:

- Fish (survival and growth), benthic invertebrate (survival and growth) and a water column, planktonic invertebrate, Ceriodaphnia dubia (survival and reproduction) were used to evaluate sediment and water toxicity.

- The low diversity and abundance of the benthic community in areas of coarse grain and high energy conditions reduces the effectiveness of the sediment triad approach for determining toxicity impacts.

- The original Menzie-Cura report should be reviewed to determine the methods used and to further determine which toxicity test method is most efficient at this site.

- An apparent effects threshold (AET) approach should be considered for developing site-specific sediment criteria for implementing RAOs. This would apply the most efficient toxicity test method(s) from the Menzie-Cura study along with chemical measurements to establish chemical-specific AETs as the basis of the RAOs.

- The monitoring proposal does not address potential adverse effects related to bioaccumulative chemicals such as PCBs or dioxin, which have low lethality to benthic invertebrates, but may present adverse risks to other receptors.

- The document should include the frequency of the proposed sediment monitoring.

ENCLOSURE 2

February 11, 2002

MEMORANDUM

SUBJECT: Sauget Area 2 Superfund Site, Sauget, IL (02-R05-001)
Focused Feasibility Study

FROM: Steven D. Acree, Hydrogeologist
Technical Assistance and Technology Transfer Branch

TO: Mike Ribordy, RPM
U.S. EPA, Region 5

Per your request for technical assistance, the referenced document has been reviewed by Dr. Hai Shen and Tom Sunderland of Dynamac Corporation and me. Dynamac Corporation is an off-site contractor providing technical support services to this laboratory. In general, ground-water extraction in the proposed area may be highly effective for the purpose of preventing or greatly reducing the discharge of contaminated ground-water into the Mississippi River. However, concerns exist regarding the stated objectives for the system, effectiveness of the proposed monitoring program, and certain aspects of the design. Detailed comments regarding these issues and other areas of concern are provided below.

1. The performance standards for the proposed extraction system are not clear from the discussions in the referenced document. Capture of contaminated ground water prior to discharge is discussed. However, the principal criterion proposed for evaluating system performance is contaminant concentrations in sediments deposited adjacent to the site. This indicates that the primary objective for this system may be contaminant flux reduction and not necessarily complete capture of the discharging plume. It is recommended that this issue be clarified as it significantly impacts development of the performance monitoring system discussed below. In addition, it is noted that performance criteria based solely on contaminant concentrations in deposited sediments will not be sufficient to evaluate the

effects of plume discharge on sediments transported in the water column. The degree to which such processes may pose significant risks at this site was not discussed.

2. A ground-water flow model (Appendix 5) was used to estimate the volume of discharging ground water adjacent to the site under conditions stated to be representative of average river stage. Although neither the construction of this model nor of the previous flow model reported in Appendix 2 were reviewed in detail, it is noted that the estimated discharge volume was used as the upper limit of target extraction rates during system design. Design of the system based on average conditions insures that total capture of the contaminant plume will not be maintained under conditions of higher hydraulic gradient (e.g., receding river stages).

If complete capture is an objective for this system or a more detailed evaluation of potential performance prior to implementation is desired, it is recommended that a more rigorous design approach be applied. Steps in this process would include examination of capture effectiveness in each aquifer unit under different river conditions using the proposed three well network and determination of the sensitivity of this evaluation to uncertainty in the modeling parameters. Particle tracking techniques should be used to aid in presentation of the results of this exercise.

3. The principal performance monitoring system for sediments consists of only four evenly spaced sampling transects providing a total of twelve locations. The basis for the proposed sampling locations was not discussed. A previous study found contaminated sediments were located within approximately 300 ft of shore. However, the impact to sediments within this limit is likely to be non-uniform in nature due to such factors as the difference in contaminant concentrations in discharging ground water, sediment transport patterns, and sediment characteristics. It is not clear whether such factors were considered. Given that this monitoring appears to be the principal means proposed for evaluating system performance, it is recommended that the rationale for choice of these locations, considering the potential complexities in contaminant flux and sediment transport, be provided.

4. The proposed ground-water monitoring system will not allow detailed estimates of the degree to which capture is achieved. The proposed evaluations of system effectiveness are predominantly empirical in nature, as noted in the plan. It is recommended that a more rigorous approach to monitoring in this complex setting be considered to allow a more informed assessment of future system modifications, if warranted. It is recommended that evaluations of the capture zones of the proposed extraction wells be based on several lines of evidence due to the complex nature of this setting and the associated difficulty in maintaining capture. It is suggested that both hydraulic gradients and ground-water chemistry downgradient and sidegradient of the capture zones of these wells be used to evaluate performance to the extent practicable.

Estimates of hydraulic gradients between the extraction wells and the river provide indications of the extent of the capture zones. Comparison of these data with the results of a robust ground-water flow model simulating the effects of various river conditions is another useful line of evidence that should be considered. Data regarding hydraulic gradients upgradient and near the extraction system would be needed to evaluate the effects of extraction under various river conditions. It appears that additional wells/piezometers located upgradient of the system may already be in place or proposed for installation during the remedial investigation. However, information on the construction and status of all wells depicted in site figures was not available to allow development of detailed recommendations concerning use of these monitoring points. In the immediate vicinity of the extraction wells, it appears that additional piezometer clusters would be needed between the proposed locations and the wells and at locations north and south of the extraction network to determine hydraulic gradients between the extraction wells and the river. Data regarding surface water stage would also be required for these evaluations. Based on the high degree of ground water/surface water interaction, it is recommended that water levels in selected wells be monitored on a frequent basis (e.g., daily) using data loggers. Current data logger technology allows a dedicated logger to be fully contained and secured within the well. More sophisticated tools such as dedicated ground-water velocity probes that provide direct measurements of ground-water flow direction and rate are also available and may be appropriate for use at this site, if a more detailed analysis of plume capture is ultimately required.

Contaminant concentrations in ground water downgradient of the capture zones should also be used to evaluate the system, if practical. The major constraint in obtaining these data is the proximity of the system to the river. Although the proposed piezometers will be useful for obtaining water levels used to estimate hydraulic gradients, the evaluations in the referenced document were not sufficient to determine whether the proposed locations may be within or downgradient of the capture zones of these wells. If the piezometers are within the capture zones, information derived from temporal trends in contaminant concentrations will be of more limited value than similar data obtained from locations downgradient of the capture zones. It is recommended that the dimensions of the capture zones be estimated under various river conditions and locations for this monitoring be assessed. Other options for obtaining such data may include the use of small diameter wells installed in the river adjacent to the site to map contaminant concentrations in ground water prior to discharge. Such installations may be temporary or permanent, depending on site conditions.

5. An extraction well design that does not fully penetrate the deep hydrogeologic unit appears to be proposed. Such designs may reduce the effectiveness of capture in the portion of the aquifer below the well screen. The rationale for use of partially penetrating wells was not discussed but should be provided for review.

6. Data indicate that dense nonaqueous phase liquids may be present in the middle and deep hydrogeologic units beneath the site. The distribution of these materials may impact the effectiveness and operation of the system. If significant lateral migration of DNAPL toward the river has occurred within any of the hydrogeologic units, this source material may be present beyond the capture zone of the proposed system. Such migration often occurs due to permeability contrasts within the geologic materials and may not be limited to the bedrock interface. Similar concerns may exist for light nonaqueous phase contaminants near the water table. Such a situation may necessitate development

of a larger capture zone and, consequently, higher pumping rates that originally conceptualized. As discussed in previous correspondence, it is recommended that data to estimate the potential extent of NAPL contamination be obtained during the planned RI/FS. This information may then be used to modify the operation of this interim extraction system, if warranted. Much of this information may be obtained from monitoring performed during installation of the proposed extraction wells and piezometers.

7. It is recommended that a performance monitoring plan be developed to explicitly define the monitoring system, monitoring parameters, frequency of measurements, and numerical performance criteria for determining acceptable system performance, as well as data used to determine the need for system maintenance. With respect to system operation and maintenance, it is recommended that this plan include monitoring of such parameters as the total extraction volume from each well on a frequent (e.g., monthly) basis and information regarding the specific capacity of each well obtained on a less frequent basis to determine maintenance needs and aid in the evaluation of observed effects within the aquifer.

If you have any questions concerning this review, please do not hesitate to call me at your convenience (580-436-8609). We look forward to future interactions with you concerning this and other sites.

cc: Rich Steimle (5102G)
Larry Zaragoza (5204G)
Luanne Vanderpool, Region 5
Doug Yeskis, Region 5

ENCLOSURE 3

Discharge Control Study

General Comments

I. The report does not provide all the details necessary to evaluate the accuracy of the groundwater model. The assumptions, hydraulic properties, and results of the numerical model are not clearly discussed in the text. Specific subject areas for which the report does not provide adequate detail are listed below.

- No definition of "significant" flow from the Mississippi River is provided with respect to the flow rate of the three pumping wells.
- Calibration techniques are not fully discussed.
- Sensitivity analyses are not discussed.
- Storage values are not provided for the various modeled layers.
- No discussion of model limitations is included.

II. The report does not clearly state whether the numerical groundwater flow model results are based on steady-state conditions, transient conditions, or both. Both steady-state and transient models should be used to accurately detail hydraulic conditions in the modeled area, or the report should discuss why one or the other type of model has not been developed.

III. The report does not clearly discuss model calibration and does not mention whether a sensitivity analysis was performed on the model. Commonly, sensitivity analyses are performed by changing hydraulic conductivity (K) values, storage parameters, recharge values, and boundary conditions and then determining the magnitude of changes in head throughout the modeled domain (Anderson and Woessner 1992).

IV. The report does not mention the presence or absence of actual confining layers between the three modeled horizons, nor does the report give a leakance value for any confining layers that may be present.

Specific Comments

A) **<u>Project Background, Page 2, Paragraph 1</u>.** This paragraph discusses the site geology and hydrogeology and provides the elevations of the three modeled layers. The report should discuss the hydrogeologic properties of any confining layers that may be present in the saturated zone.

B) **<u>Key MODFLOW Model Attributes, Assumptions, and Input Parameters, Page 4, Bullets 1 and 2</u>.** These two bullets discuss the average river level stage and riverbed conductance values used to represent the Mississippi River in the groundwater model. The bullets do not mention whether the river was simulated using MODFLOW's river package feature or another method. The "Modeling Approach" section of the report only refers to the river simulation in terms of "river cells" and provides no further explanation as to how the river was represented. Clarify the method used to represent the river in the modeled domain.

C) **<u>Key MODFLOW Model Attributes, Assumptions, and Input Parameters, Page 4, Bullet 5</u>.** This bullet briefly discusses the regional pumping center along the north edge of the modeled domain. The pumping center is said to have a discharge rate of 4,167 gallons per minute (gpm). The bullet does not discuss which model layer or layers are being pumped by the pumping center. The bullet also does not mention whether the discharge rate of 4,167 gpm is constant or an average or whether there is any knowledge of the pumping continuing at this rate in the future. The report should discuss: 1) the effect of the pumping center on groundwater flow at the site; and 2) the expected activity at the pumping center in the future and its probable effect on groundwater flow at the site.

D) **<u>MODFLOW Calibration, Page 4, Paragraph 1</u>.** This section states that flow calibration was performed by adjusting the river level to 398.5 feet above mean sea level (amsl), which was the average river level during the 24-hour period preceding the midpoint of the sampling period. This value differs greatly from the average river stage value of 391 feet amsl stated in the "Key

MODFLOW Model Attributes, Assumptions, and Input Parameters" section. No justification is provided in the report for selecting the value of 398.5 feet amsl for the calibration simulation. The report should explain the use of the two different river stage values.

E) **MODFLOW Calibration, Pages 4 and 5**. This section discusses the model calibration methods and results. Although the text cites Table 1, which compiles the results of the statistical analysis of the modeled and observed water level data, minimal discussion of these results is presented in the text. For example, the results of the statistical analysis included a root mean square (RMS) value of 3.19 for model layer 1. This value suggests a poor match of the modeled water level data to the observed water level data. The report states that "because of the small contribution to flow to the river from Layer 1, this match was considered to be acceptable." However, the large RMS value calculated for layer 1 may have resulted in significant modeling error. The report should expand the discussion of why this RMS value was acceptable. For example, the report could point out that an unconfined aquifer such as layer 1 is more difficult to accurately represent than a confined layer.

In addition, this section discusses the K array used for each layer in the model. U.S. EPA assumes that a uniform K array was used for layer 1 because of a lack of spatial data; however, the K values for layers 2 and 3 varied laterally across the modeled domain. According to Table 1 of the report, layers 2 and 3 actually had fewer data points on which the spatial variation of K could be based. The report should discuss why K values varied spatially in layers 2 and 3 but were uniform in layer 1.

This section also discusses the calibration of modeled layer 1. To better match simulated hydraulic head values to observed values, the uniform K array of layer 1 was reduced from 0.01 to 0.0005 centimeters per second, a change of nearly two orders of magnitude. The report does not discuss performance of a sensitivity analysis to determine the effect of a large reduction in K. The reduction in K may have resulted in layer 1 appearing to contribute little flow to the river. The report should discuss the impact of reducing K in layer 1.

F) **Modeling Approach, Page 5, Paragraph 2**. This paragraph discusses determination of the flow rate of contaminated groundwater to river cells in layers 1 and 2. The paragraph does not fully discuss the hydraulic and physical attributes of the river cells used in the model. To fully conceptualize the hydraulic and physical properties of the river cells, information such as the length of each river reach, the width of the river, and the thickness of the riverbed should be provided (McDonald and Harbaugh 1988). The report should include this information.

G) **Modeling Approach, Page 5, Paragraph 2**. This paragraph discusses evaluation of different flow control pumping schemes. The report states that the "most vulnerable location for river flow inflow to a Site R flow control well was determined." The report does not explain what "vulnerable" means in the context of flow rates from the river and discharge rates from the pumping well. Also, the report does not discuss how the "most vulnerable location" was determined. The report should clarify these matters. In addition, the paragraph refers to a "critical well" at which the discharge rate was increased to determine the pumping rate that would cause inflow from the river. The report does not clearly state which well is the "critical well," where this well is screened, or where this well is located. The report should clarify these matters as well.

H) **Modeling Results, Page 5, Paragraph 2**. This paragraph states that the maximum sustainable pumping rate that does not result in inflow from the river is between 200 and 250 gpm. U.S. EPA assumes that this range is based on the discussion in the "Modeling Approach" section; however, the report does not clearly explain how the range of 200 to 250 gpm was determined. The report should explain the determination of these values.

I) **Figure 1**. This figure does not contain a legend that defines the various colored zones in the modeled area. The figure should include a more complete legend that defines these zones. Also, this figure does not identify the locations of any confining layers in the saturated zone. The locations of any confining layers present should be identified in the figure.

J) **Figure 5**. This figure depicts the locations of river discharge zones and discharge control wells for the three modeled horizons in the study area. Layers 2 and 3 appear to be mislabeled in the figure.

K) **Attachment C**. This attachment contains a U.S. Army Corps of Engineers (U.S. ACE) map of the Mississippi River (river miles 178.2 to 180.3) and is represented as being in the vicinity of Site R. However, a more appropriate U.S. ACE river map containing Site R– that for river miles 176.2 to 178.2– is not included. The attachment should include the U.S. ACE river map containing Site R (river miles 176.2 to 178.2) and the appropriate hydrographic data from this map used as input in the MODFLOW model.

REFERENCES

Anderson, M.P., and W.W. Woessner. 1992. *Applied Groundwater Modeling*. Academic Press. San Diego, California.

McDonald, M.G., and A.W. Harbaugh. 1988. "A Modular Three Dimensional Finite-Difference Ground-Water Flow Model." *Techniques of Water Resources Investigations of the United States Geological Survey*. Book. 6. Chapter. A1.

Technical Specifications

Specific Comments

I. **Page 7, Section 2.2.1, Well Casing Pipe**. The text states that well casing pipe must be "10-inch I.D. low carbon stainless steel." However, the type of stainless steel and the thickness of the casing are not specified. Typically, specifications include this type of information. Low-carbon stainless steel is usually Type 316L. Also, the diameter of stainless steel pipe is usually identified in terms of outside diameter. The text should include this missing information.

II. **Page 7, Section 2.2.2, Grout, Part A**. The text states that "neat cement grout" consists of "cement and water in proportion of 1 bag (94 lb) Portland cement to 8.3 gal clean water." Part B, however, states that the mix design "shall be approved by the REMEDIAL DESIGNER." It is not clear why the remedial designer has to approve the mix design when it is presented in Part A. Also, the type of cement required is not clear. The text should identify the type of cement required for the grout and clarify the mix design requirements.

III. **Page 8, Section 2.2.3, Screen, Part B**. The text specifies that the screen must be Type 304 stainless steel with a nominal diameter of 10 inches. Because low-carbon stainless steel is specified for the well casing pipe, it is advisable to use the same type of stainless steel for the well screen. Type 304 stainless steel has a carbon content of 0.08 percent, which is almost three times greater than the carbon content of the stainless steel specified for the well casing pipe. The material requirements for the screen should be reviewed in light of this information.

IV. **Page 9, Section 2.2.6, Part C**. The text calls for a "steel pitless case of the same size as [the] well casing, with black corrosion resistant coating." It is not clear why a corrosion-resistant coating is required; if stainless steel is used, corrosion should not be a significant problem. Also, it is not clear what type of "black corrosion resistant coating" is required. In addition, the material of construction for the pitless adapter is not specified. The text should clarify these matters.

V. **Page 9, Section 2.2.7, Galvanized Steel Drop Tubing**. It is not clear why galvanized steel tubing is specified for what appears to be a well pump discharge. Also, the thickness of the tubing is not specified. If the installation is designed for 30 years of useful life, stainless-steel, schedule 40 pipe should be specified as the discharge pipe material. Typically the well pump is supported by the discharge piping, as it is the pump's and piping's weight that maintains the seal in the pitless adapter. The text should be revised in light of this information and the construction material and the class or schedule of the discharge piping should be specified.

VI. **Page 10, Section 2.3.3, Part B**. Phrasing such as "it is suggested that" should be avoided. The specifications should be clear and concise regarding the drilling method to be used for installation of wells. If necessary, the specifications should include a provision for the contractor to propose an alternative drilling method that can be accepted or rejected by the engineer.

VII. **Page 10, Section 2.3.4, Part B**. The text implies that boreholes will be sampled during drilling; however, the sampling intervals and method are not specified. The text should clearly state the sampling intervals and procedures required.

VIII. **Page 11, Section 2.3.5, Part H**. The text requires the contractor to conduct a short- duration performance test for each well. It is not clear what the objective of this test is or what will determine acceptance or rejection of a well. The text should be clearly state the test objective and the criteria for well acceptance.

IX. **Page 11, Section 2.3.6, Part A**. This section calls for decontamination of drilling equipment when it arrives on site and before it leaves the site. It is not clear, however, whether down-hole drilling equipment will be decontaminated between boreholes. The text should clarify this matter.

X. **Page 12, Section 2.3.7, Part A**. The text discusses collection and containerization of liquids generated during well installation. However, it is not clear whether these liquids will be sampled for analysis or how they will be disposed of. The text should clarify this matter.

XI. **Page 14, Section 3.1.3, Part B, Subpart 1**. The specification requires submittal of a "pump manufacturer's statement of overall efficiency guarantee for [the] pumping unit under specified conditions." The conditions are not clearly specified. The text should specify the conditions if such a guarantee is to be required.

XII. **Page 14, Section 3.1.6, Parts A, B, and C**. If it is expected that pumping conditions will vary greatly, it would be prudent to specify pumps with variable-frequency drives. Such pumps would accommodate a range of flow rates and any future adjustments required by fluctuations in groundwater levels caused by pumping or seasonal factors. Dropping groundwater levels will increase the static head, reducing the pumping rate required. Pumps with variable-frequency drives can provide the desired discharge rate regardless of changes in static head. The text should be reviewed in light of this information and revised as necessary.

XIII. **Page 15, Section 3.2.2, Part D**. The specification states that "pumps shall be sized to provide at least 220 gallons per minute (plus or minus 20%) flow rate against a total head of at least 70 feet, depending on final design parameters for the conveyance system." This is an unusual requirement. Typically, pump specifications state the required pumping rate at a fixed total dynamic head for constant-speed pumps. The plus or minus 20 percent allowance for the flow rate might allow the contractor to choose between two pump sizes, and the contractor would probably furnish the smaller or less expensive pump, which might be too small in the long run. The text should be reviewed based on these considerations and revised as necessary.

XIV. **Page 15, Section 3.2.3**. According to Drawing No. 3, it appears that the check valve will be located in each well on top of the well pump. This placement of the check valve may cause maintenance problems, as the valve would not be accessible. Also, high shutoff head may cause the valve to fail prematurely as a result of flow reversal. Because the drawings indicate use of valve vaults, it may be advisable to install the check valves in these vaults, where they will be easily accessible for maintenance and will not be exposed to high shutoff head. Additionally, check valves for such installations are usually specified to be of stainless-steel construction. The design should be reviewed in light of these considerations, and the specification should be revised as necessary.

XV. **Page 16, Section 3.2.4, Part B**. The text requires the contractor to "provide flow control valves to prevent flow rates above [the] operating range of [the] well pump." However, it is not clear what this operating range is. It is also not clear what types of valves are required or what their materials of construction are to be. Use of pumps equipped with variable-frequency drives would eliminate the need for these valves (see comment no. 12). The design should be reviewed in light of these considerations, and the specification should be revised as necessary.

XVI. **Page 17, Section 3.2.7, Part E**. The text should be revised to read as follows: "Pump motors shall be non-overloading throughout their entire operating range."

XVII. **Page 27, Section 5.2.2, Part B**. The text states that the pumps will be operated by level switches located in each extraction well. However, the operating range of the switches and the distance between the switches in each well are not specified. Also, it is not clear whether fluctuations in groundwater levels will be addressed by the control scheme. These matters should be clarified. In addition, the text indicates that a high high-level switch will initiate a remote alarm in the Department 277 control room, which will be more than 6,000 feet away from one extraction well. The remote alarm is not shown on the drawings, and therefore it is not clear whether this alarm will be hard-wired or activated via an autodialer. The text and drawings should be revised to clarify this matter.

XVIII. **Drawing No. 2**. This drawing shows what appears to be a single force main to which the three well pump discharges will be connected. It is difficult to evaluate this system because no pipe sizes are included on the drawings or in the specifications. This information should be shown on the drawings to facilitate the review process and avoid confusion during bidding. Drawing No. 2 also shows electrical lines to be underground electrical feeders. However, the conductor sizes required are not shown. This information should be provided on the drawing. It should be noted that running a long feeder from the pole barn to the well located furthest south will likely produce a voltage drop because of the distance involved (about 2,000 feet).

XIX. **Drawing No. 3**. The specification in Section 3.2.6 calls for a submersible cable with at least 5 extra feet available for termination in a junction box at the "pump head, or wellhead." Drawing No. 3 does not indicate that the submersible cable will terminate in a junction box at the wellhead. Rather, the drawing indicates that the submersible cable will enter the electrical conduit through the well casing and run underground to a junction box just below the control panel; this is the only junction box shown. The discrepancy between the text and drawing should be reconciled. The drawing also indicates that power cables and flow sensor telemetry will be installed in the same schedule 40 polyvinyl chloride conduit. Installing power and telemetry wiring in one conduit is not recommended. This design element should be reviewed and revised as necessary.

XX. **Drawing No. 4**. It is not clear why manhole steps are required in the vault shown. The vault will be only 3.5 feet deep and will have a sampling port located under the 30-inch-square access cover, making it impossible to enter. Also, the 3-inch ball valve downstream from the sampling line will be difficult to operate as it is presently configured. In addition, flow sensor wiring should be terminated in a waterproof junction box. Moreover, a provision such as a French drain should be included in the design to remove accumulated rainwater. The drawing should be reviewed in light of these considerations and revised as necessary.

ENCLOSURE 4

Comments on the Preliminary Discharge Control Study Site R, W.G. Krummrich Plant, Sauget, Illinois

Prepared by Bob Root/CH2M HILL
December 13, 2001

I have reviewed the report on the study in detail and the design to a lesser degree. My comments are provided below. They are separated as to whether or not I consider them major or minor but with significance.

Major Comments

The report describes a groundwater-modeling application that is relatively straightforward and uses a publicly available modeling code that is well documented and benchmarked. Therefore, the tools used for the modeling appear to be appropriate and adequate.

There is little detail in the report about how well the model was calibrated, why there was a need to make such large changes between initial guesses and calibrated values for several of the hydraulic conductivity values, and other modeling issues. This makes it difficult to fully endorse the modeling results. I think that more of this type of information should be provided to make the report more robust. However, under the assumption that a competent hydrogeologist with a good understanding of the site and groundwater-flow modeling performed the work, then the modeling results can be assumed to be appropriate and representative to the extent that the data allows.

However, I question the appropriateness of one of the underlying assumptions of the study. The first objective of the modeling was to "estimate the flowrate of affected groundwater … during average river level conditions." The pumping scheme then was designed to capture this amount of contaminated groundwater before it reached the river.

However, the river is probably rarely ever at this level except when the water level is changing upwards or downwards through this level. In that case, for maybe half the time, the river level is less than the average level, the hydraulic gradient is higher toward the river than during average conditions, and more contaminated groundwater discharges to the river than during average conditions.

Therefore, it seems that a potentially large amount of contaminated groundwater might pass by the extraction system because it is not pumping at high enough of a flowrate during these times.

This seems like an unusually severe restraint. It might be better to look at a frequency distribution of flow in the river, design the extraction system for a water level that occurs maybe 75 percent to 85 percent of the time, and then plan to adjust the pumping rate downward as the river level comes up and reduces the flow of contaminated groundwater to the river. The adjustable system could also be designed to shut off entirely if the river level rises to a level at which river water would begin flowing back into the groundwater system under non-pumping conditions.

At the very least, the report should include some sensitivity analyses to estimate how much contaminated groundwater might discharge to the river under lower-than-average water level conditions. If it can be demonstrated to be within acceptable amounts, then perhaps the designed system is appropriate.

That said, it is possible that the "average river level conditions" refer to a level maintained by the Corps for a significant part of the time, in which case use of the average condition probably is appropriate. If so, this should be stated clearly in the report.

Minor Comments

Please note the following comments that are minor, but I think still have some significance in helping the reader understand and evaluate the work discussed in the report:

- In the first bullet on page 3, I believe the reference is to Figure 2 (the finite-difference grid) not to Figure 1 (the cross section.). However, this leaves no specific reference to Figure 1 except below in the fifth bullet on the page.
- In the third bullet on page 3, it would be helpful to note where the initial hydraulic conductivity values for the shallow layer came from. If they were just made up, this could account for why there was such a large change from the initial value (0.01 centimeters per second [cm/sec]) and the calibrated value (0.0005

cm/sec) for the horizontal hydraulic conductivity for this layer.

- The reference to Figure 2 (the finite-difference grid) on page 3 should be a reference to Figure 3 (the hydraulic-conductivity results).
- On page 5, the statement is made that there was a "good relative match" between the "potentiometric surface from the middle horizon" and the "potentiometric surface for November 1990." Is the first potentiometric surface mentioned the one that was calculated? This should be made clear. Assuming that it is, maps should be provided showing the calculated and observed potentiometric surfaces so that the reader can make their own judgment on the quality of the calibrated fit. And I assume there should be a reference to Figure 4 here because I see no other specific reference to this figure.
- I see no specific reference to Figure 5, another set of finite-difference grid layouts.
- It would be helpful to know where the wells used as calibration targets and listed in Table 1 are so that the degree of fit of computed water levels to observed ones can be better evaluated. For instance, are the wells spread evenly over the site or limited to one or two areas?
- Is there some risk of missing contamination if the discharge control wells are only partially penetrating, as they are shown and specified in Figure 1?
- Shouldn't Figure 6 show all three wells? Supposedly it is the evaluation of the downgradient capture zone but it only shows the well nearest the river, as referenced on page 5. Also, the water-level contours appear to be badly mislabeled. If these contour labels are correct, then the modeling is a mess and this becomes the FIRST MAJOR comment.

ENCLOSURE 5

217/782-6762

February 15, 2002

Mr. Michael Ribordy
U.S. EPA Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, Illinois 60604-3590

Re: 1631215032 St. Clair County
Sauget Area 2 Site
Superfund/Technical
Administrative Order by Consent dated November 24, 2000
Focused Feasibility Study/ Groundwater Contamination Near Site R

Dear Mr. Ribordy:

The Illinois Environmental Protection Agency ("Illinois EPA") received the draft "Focused Feasibility Study, Interim Groundwater Remedy, Sauget Area 2 Sites O, Q, R, and S" ("FFS"), for the groundwater contamination near Site R, dated December 21, 2001 and received on December 24, 2001.

I have performed a cursory review of this document and provided my comments as listed below.

General Comments

1. Some of the data sources were not from USEPA or IEPA contractors or approved by USEPA or IEPA. For example, the plume boundaries shown on Figure 1-1 are subject to future discussion. For the record, IEPA does not endorse or necessarily approve the background information and data presented in the FFS.

2. To the extent consistent with the Scope of Work for the Interim Remedy, groundwater restoration should be included as an Interim Remedial Action Objective. This may have been implied under "prevent or abate actual or potential contamination of drinking water supplies and ecosystems" (FFS, p. 1-16).

3. The Illinois EPA does not agree that sediment toxicity monitoring should be the primary means to determine the effectiveness of the Interim Groundwater Remedy. The migration of contaminants in the vicinity of Site R to the Mississippi River has a direct impact on groundwater and surface water in terms of exceeding groundwater quality and

surface water quality criteria, in addition to impacting sediments in the river. Similarly, the remedial action objectives are not entirely satisfied only if the mass loading from the contaminant plume is reduced to the point where sediment toxicity is reduced to "acceptable levels for an appropriate period of time" (FFS, p. 1-18). There are surface water and groundwater impacts of the contaminant plume that can be monitored for reduction.

4. As stated in the FFS (p. 1-19), the remedial objective is to completely control groundwater discharge to the Mississippi River. This should be included in separate discussion of Remedial Action Objectives (Section 1.3, Section 3.0).

5. There appears to be an omission in discussion of the groundwater routing and treatment under Alternative B-Hydraulic Barrier. The extracted groundwater is to be routed to Krummich Plant sewer system via subsurface pipe. The Krummich plant wastewater is routed to the Village of Sauget PChem plant for pretreatment and then discharged to the American Bottoms Regional Treatment Facility for treatment and discharge to the Mississippi River through a diffuser. The FFS states (p.1-22) this will be done in compliance with all applicable regulations and permit requirements, but no discussion is provided on whether this is a technically feasible or regulatory allowable option to pursue. A major issue to be addressed is whether additional pretreatment must be provided for the extracted groundwater, beyond that provided by the Sauget PChem plant, and whether it is even allowable to discharge the extracted groundwater to the Sauget PChem plant, and ultimately tributary to the American Bottoms Regional Treatment Facility. Technical issues and concerns which need to be addressed are:

(A.) What is the physical condition of the Krummich plant sewer system? Will leakage occur through cracks and joints in the Krummich sewers? What provisions are made for detection of leakage from the newly installed pipe to the Krummich sewer system?

(B) Provide a loading evaluation to demonstrate the discharge will not impact the American Bottoms Regional Treatment Facility in terms of causing pass-through, or interference with the operation of the plant (40 CFR 403). Indicate whether there is a need to change the granular activated carbon feed rate at the treatment facility. Evaluate the impact in terms of specific numerical limits in the NPDES permit, and acute and chronic toxicity.

(C) Specify the local and state permitting requirements.

(D) Indicate notification requirements pursuant to the NPDES permit, and evaluate the potential need to modify the NPDES permit for American Bottoms Regional Treatment Facility. See Special Condition 7D, General Condition 15 of the NPDES permit.

(E) Does the Sauget PChem Plant have the treatment technology and capacity to treat for the pollutants and range of contaminant concentrations expected in the groundwater?

(F) Will the discharge from the Sauget PChem plant meet local sewer use ordinance requirements and local discharge limits? Will the local limits need to be modified as a result of the groundwater discharge?

(G) State ARARs, in addition to those referenced, will likely include the following:

(i) 35 Ill. Adm. Code 306 Performance Criteria, Subpart C Combined Sewers and Treatment Plant Bypass, Section 306.302, 306.402, 306.403.

(ii) 35 Ill. Adm. Code 307 Sewer Discharge Criteria, Subpart A General Provisions, Section 307.1101.

(iii) 35 Ill. Adm. Code 309 Permits, Subpart B Other Permits, Section 309.202(a), 309.202(c).

Should you have any questions or comments on the contents of this letter, please feel free to contact me at 217/557-3199.

Sincerely,

Sandra Bron, Remedial Project Manager
National Priorities List Unit
Federal Site Remediation Section
Bureau of Land

Cc: Mike Henry, IDNR
Kevin de la Bruere, USFWS
Terry Ayers, Manager, NPL Unit
Dean Studer, Bureau of Water